Modular Reconfigurable C4I Interface (MRCI)

Frequently Asked Questions (FAQs)

1.0 What is the Modular Reconfigurable C4I Interface (MRCI)?

MRCI is an interface between live C4I system(s) and the High Level Architecture (HLA) Runtime Infrastructure (RTI). The MRCI is responsible for seamlessly connecting the C4I system(s), via its/their real world communications messages and protocols, with the synthetic environment provided by simulation federates of an HLA Federation. Simulation functionality is not permitted within the MRCI.

The MRCI contains three components: 1) a computer software configuration item (CSCI) expected to contain Common Modules (CM), used to support a range of C4I systems, whose functions include representation of communications degradation and message translation between the C4I system(s) and the Data Interchange Format (currently CCSIL) used among the simulation federates; 2) the RTI Interface (RTII) which provides an interface between the Common Modules and the RTI and Simulation Ambassadors; and 3) the System Specific Interface (SSI) between each C4I system and the common modules.

2.0 Will the MRCI be used to connect simulations to the RTI?

No. HLA Simulation Federates will provide their own HLA interface compatible with the Federation Object Model (FOM) of the Federation in which they are participating.

3.0 Will the MRCI become a DoD mandated requirement?

No, only HLA compliance is specified in the DoD M&S Master Plan. C4I systems, however, will require an HLA-compliant interface to communicate with HLA-compliant DoD simulations. The MRCI will provide such an interface and will be available as shareware.

4.0 What licenses will be required to use MRCI?

The MRCI software, comprised of the System Specific Interface (SSI), Common Modules (CM) and Runtime Infrastructure Interface (RTII) computer software configuration items (CSCIs) will be government off the shelf (GOTS) software. The graphical user interface (GUI), however, will be Motif-based, which will require the MRCI host computer to have Motif installed. Otherwise, the only operating environment need of MRCI software is UNIX. The initial version of MRCI software will operate under SOLARIS and IRIX operating systems. Experimentation will be done to

investigate the operation of MRCI software under UNIX emulators on PCs but no prognosis of the efficacy of such operations can be made at this time.

5.0 What software/hardware requirements must be met by the C4I system to use the MRCI?

The C4I system used by the training audience within the C4I Federate **has no additional hardware requirement or software requirement levied upon it by the presence of the MRCI at its HLA interface.**

The paradigm used in implementing the MRCI design is summarized graphically in Figure 5.1. An MRCI Control Node (Figure 5.2) is used to "couple while insulating" the training systems and the HLA Federation providing the stimulation and response to C4I system actions. This control node contains a functional copy of the C4I system into which the tentacles of the MRCI SSI extend to provide access to time, database and GUI functions for harmonization and alignment of temporal and physical battlespace and entity attributes among the C4I systems used by the training audience and the synthetic environment.

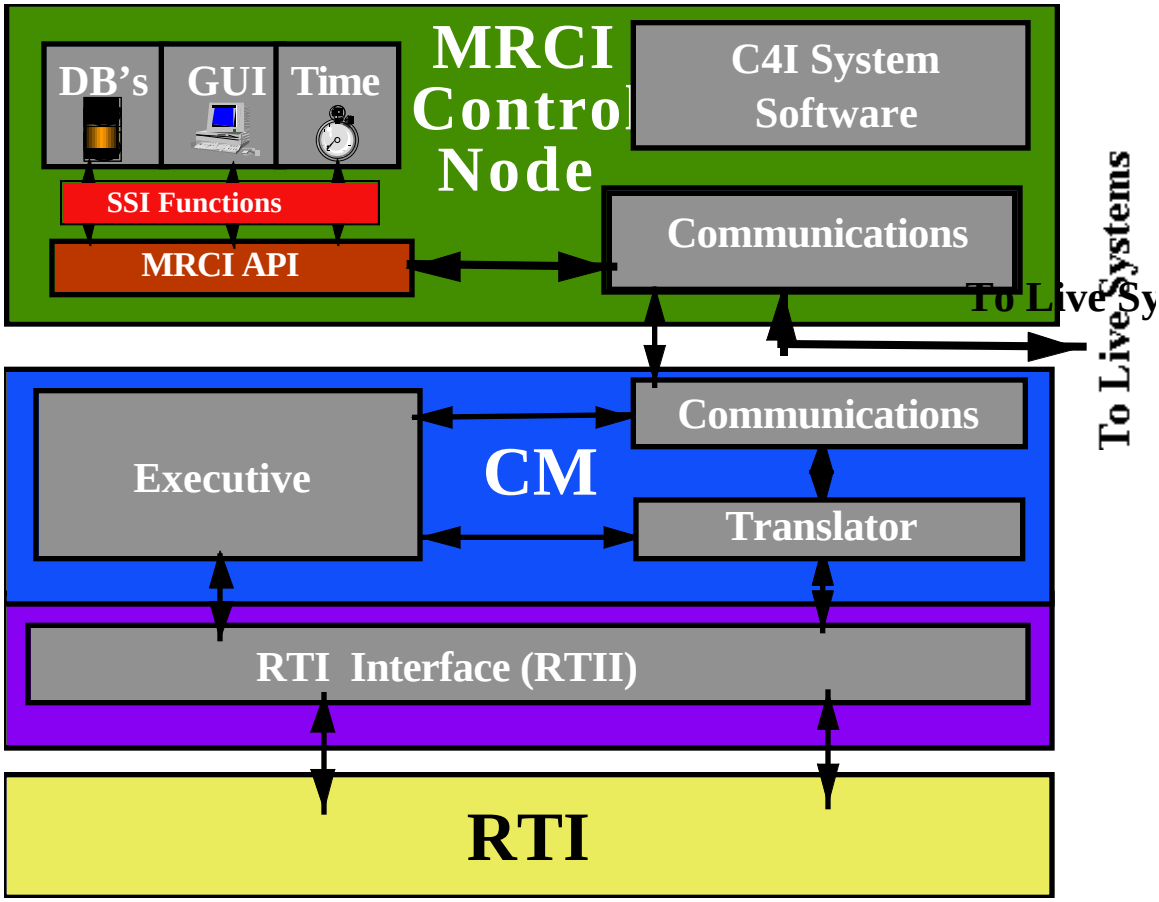

Figure 5.1. MRCI System Design

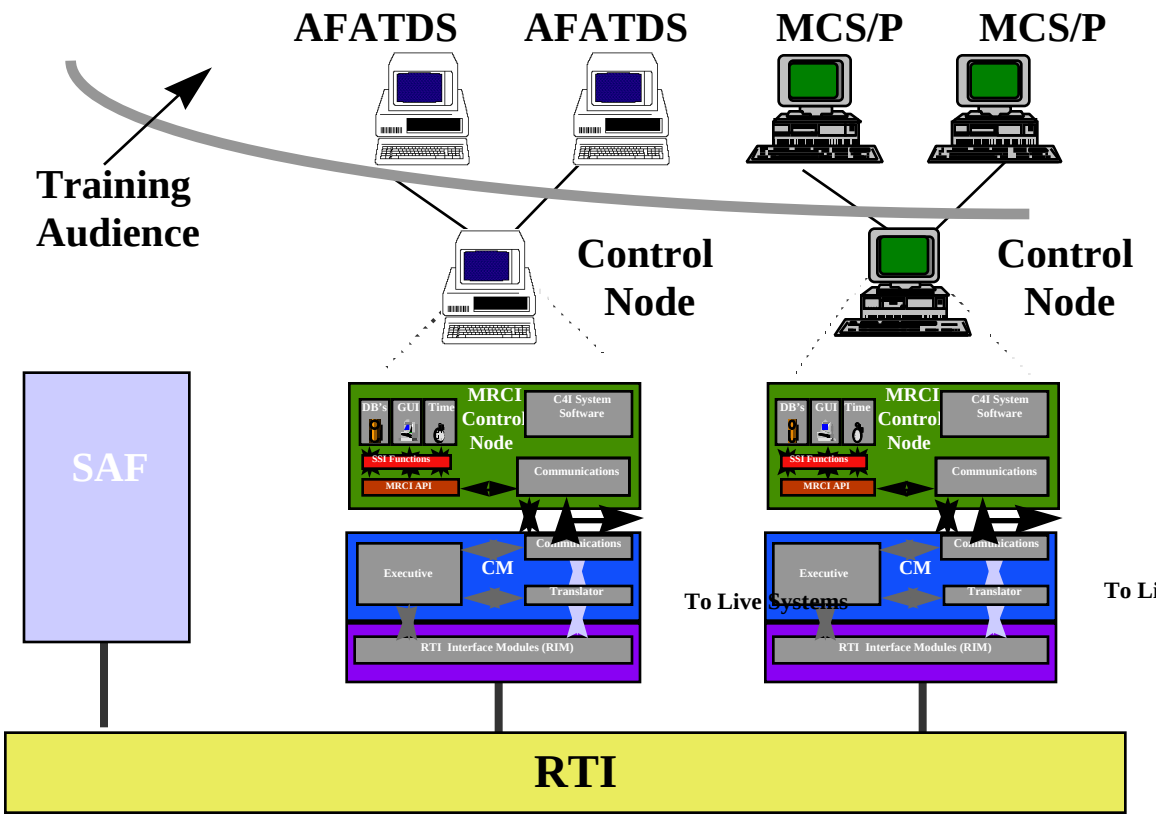

Figure 5.2. The Control Node Concept and the MRCI Relationship With the Training Audience

For certain C4I systems (e.g. Advanced Field Artillery Tactical Data System [AFATDS], Maneuver Control System [MCS]) which use the Tactical Communications Interface Module (TCIM) in their combat configurations, the MRCI control node (a tightly integrated version of the C4I system with the MRCI SSI) will also maintain an interface to the TCIM to meet the real world communications needs of the training audience. The TCIM is Government Furnished Equipment.

6.0 Who pays for legacy model conversion costs?

The Services/Sponsors of existing or emerging simulations are responsible for making their simulations HLA compliant. If the MRCI prototype is successful, the MRCI will ultimately provide a reconfigurable interface to support HLA Federation interactions for C4I systems. The build of the MRCI SSI and perhaps additional common modules to accommodate the real world message formats and content should be a one-time non-recurring investment by the C4I system developer.

7.0 How are MRCI requirements prioritized?

Requirements are prioritized by DMSO/NRaD in close collaboration with the C4I system sponsor/developer agency. Careful consideration is given to not only the needs of the C4I system but also the capabilities of the federation simulation federates to meet those needs. This consideration will help avoid premature investment by the C4I system sponsor in MRCI translation or object attribute extrapolation (e.g. communications degradation) features that simulation federates were not ready to deal with.

8.0 Does MRCI require me to host any software on my C4I system?

[see also related question 5.0]

No, not on the systems used by the training audience. The preliminary MRCI design included a MRCI API on each participating C4I system. The community, especially the C4I systems community, saw this as a violation of the MRCI requirement of non-intrusiveness to the C4I system. "Tentacles" into the C4I system are, however, needed to satisfy MRCI requirements to allow database transfer in support of exercise generation, exercise synchronization, AAR, and etc.

The solution to satisfy all MRCI requirements is as follows. Each C4I program will give a copy of their software to the MRCI program for embedding in the MRCI control node. The MRCI tentacles will be built into the control node software. As a part of the MRCI, configuration control of the control node is now the responsibility of the MRCI program. The training audience C4I systems are untouched and remain the responsibility of the C4I PM.

9.0 Does every C4I system need an MRCI to participate in a federation?

Any given configuration of MRCI(s) and C4I systems is highly dependent on the level of partitioning of the training audience both vertically and horizontally from a command and control perspective. For example, a federation designed to stimulate and respond to a battalion-to-platoon AFATDS-supported fire control mission thread would probably invoke separate federates (and therefore separate MRCIs) for the participating elements. The performance consequences of various MRCI/C4I topologies will be investigated via experimentation.

10.0 How will degraded communications and other effects work with regard to the C4I systems?

Communications link degradation and other effects will be modeled in federates other than the C4I federates, outside of the MRCI. The results calculated by those models will be applied at the reception point. In the case of a C4I federate, this degradation will be

applied by MRCI common modules after the message has been translated back from the CCSIL format into the real world format and protocol. In the case of a simulation federate representing an entity or group of entities, it is expected that degraded communications from a C4I system to a synthetic entity within a simulation federate will be applied after CCSIL translation back into the inputs expected by the simulation.

11.0 How will MRCI perform Time Management?

The RTI manages time for the federation. The MRCI SSI has a clock interface module which maintains the alignment of the C4I system time with the Federation/RTI time. Alignment in this case means assuring that messages from the synthetic battlefield to the C4I federate arrive at the correct time (delayed appropriately for the C4I system configuration and synthetic battlefield characteristics). The issue of the operations of C4I systems in other than real time is a research topic to which the MRCI testbed will be applied after demonstration of initial operational capability in Feb 96.

12.0 Will the MRCI CCSIL translator be common?

The logic used to manage the Real World Message-to-CCSIL and CCSIL-to-Real World translations will be common. The message templates used for transposition and mapping across message sets to CCSIL will be common across C4I systems to the extent their use of VMF, TACFIRE, USMTF is common. Translator augmentation for new message sets or variants of existing message types will be confined to simple addition or modification of templates used by the translator.

13.0 What happens to a CTAPS ATO if there are format errors?

In the '96 prototype MRCI, the ATO is sent back to CTAPS because the simulation federates (NASM/AP and AFSAF) would not be able to deal with the incomplete CCSIL interpretation of the incomplete ATO. Any activity within the MRCI to supplement an input ATO would most likely be viewed as simulation occurring within the MRCI, e.g. simulating the person(s) who would fill in the gaps on the receiving or sending side in real life.

14.0 Where will the knowledge reside in the federation about whether a message's intended recipient is simulated or real?

In the Runtime Infrastructure. Such information will be reflected as a live vs. simulated label on messages presented to the C4I system via the MRCI SSI.

15.0 What if only part of the information required to build a message is available in a given experiment? Will MRCI fill in the blanks?

See answer to question 13.0 regarding simulating within the MRCI. This will be a selectable capability of the MRCI and will be investigated in the '96 experiments.

16.0 How do you handle security features across a NOFORN and releasable to foreign countries?

All MRCI test federations will operate in the "system high" mode depending on bulk encryption of network traffic and physical security at each of the federates. Multi-level security issues are being addressed in other DMSO and DoD-wide initiatives.

17.0 What communications package will set up communications channels on b/w available?

The C4I federate will be using its normal communications infrastructure. Any bandwidth apportionment or traffic control based on sensed link utilization will be done the way the C4I system normally does it.

18.0 Is the MRCI scaleable?

The current MRCI design offers extensive opportunities for parallelization of critical functional strings such as translation of messages and communications degradation application. Part of the research involved in this project is assessing the scalability of the MRCI from the perspectives of traffic handling capability and expansion of the number of C4I systems on the top side of the C4I federate lollipop.

19.0 How much latency will MRCI add?

The primary source of latency is probably the translator string. It is expected that the translator will function with a throughput rate commensurate with maintaining temporal accuracy and accurate causal mapping between activities at the live federates and the simulation federate execution. Latency added by the prototype MRCI will be determined in testing this year.

20.0 Does MRCI do any data filtering?

A simulation object model developed for the C4I system and its MRCI Control Node will define the messages expected to be sent and received by the C4I federate. MRCI will not filter out any SOM-compliant messages generated by the C4I system or sent to the C4I system from the federation. Messages sent by the C4I system which are not SOM-supported are logged, stored and notification of these actions is given to the MRCI Control Node of the C4I system.

21.0 What about data collection in the MRCI?

All message traffic into and out of the MRCI will be logged.

22.0 What experiments will be performed in '96?

The '96 MRCI experiments include the following:

1. CTAPS <--> AFSAF (STOW)
2. MCS/P & AFATDS <--> Army SAF/CFOR (STOW)
3. CTAPS <--> JSIMS Testbed
4. MCS/P & AFATDS <--> JSIMS Testbed
5. MCS/P & AFATDS <--> CBS, direct to Master Interface without RTI.

23.0 What is the MRCI Configuration Management Plan?

Assuming success of MRCI prototype, DMSO, in conjunction with MRCI PM, will be responsible for, and provide, configuration management of the common modules and the Runtime Infrastructure Interface of the MRCI. Periodic configuration management meetings will be convened to determine appropriate additions, deletions, or modifications to software and documentation.

24.0 Who performs VV&A on the MRCI?

Verification of the MRCI prototype will be accomplished by NRaD as executive agent for MRCI development to the DMSO/PM. If the MRCI is successful the following plan will be executed:

1. MRCI toolset Verification - NRaD for DMSO/PM
2. MRCI/C4I package Validation - NRaD for C4I system PM
3. MRCI/C4I package Accreditation - C4I system PM
4. Federation Accreditation - DoD user

What level of IV&V will MRCI be tested?

IV&V of the MRCI software will be performed at the computer software component level in accordance with the test plans developed as part of the current MRCI project.

Who will provide what type of documentation for the MRCI?

During prototype, DMSO will make MRCI progress reports available. If MRCI prototype is successful, DMSO in conjunction with MRCI PM will be responsible for, and provide, documentation for MRCI. Such documentation may include: design

documentation, source code, troubleshooting, and user manual. MRCI documentation is available on the DMSO home page: http:\\www.dmso.mil.